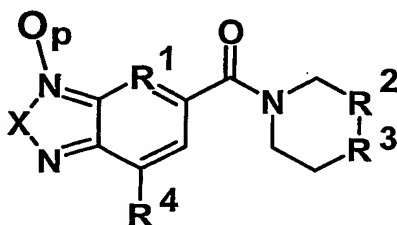


## WHAT IS CLAIMED IS:

1. A method for treating or preventing cognitive impairment as a result of acute or chronic sleep deprivation, comprising administering to a subject or patient an effective amount of an AMPA receptor potentiator.

2. The method of claim 1 wherein the AMPA receptor potentiator is a compound according to the structure:



wherein X = oxygen or sulfur; R<sup>1</sup> is selected from the group consisting of -N=, -CR=, or -CX=; R<sup>2</sup> is selected from the group consisting of -(CRR')<sub>n</sub>-, -C(O)-, -CR=CR'-, -CR=CX-, -CRX-, -CXX'-, -S-, and -O-, and R<sup>3</sup> is selected from the group consisting of -(CRR')<sub>m</sub>-, -C(O)-, -CR=CR'-, -CRX-, -CXX'-, -S-, and -O-; R<sup>4</sup> is R or X; X and X' are independently selected from -Br, -Cl, -F, -CN, -NO<sub>2</sub>, -OR, -SR, -NRR', -C(O)R, -CO<sub>2</sub>R, or -CONRR', wherein two groups R or R' on an individual group X, or on two adjacent groups X, may together form a ring; and

R and R' are independently selected from (i) hydrogen, (ii) C<sub>1</sub>-C<sub>6</sub> branched or unbranched alkyl, which may be unsubstituted or substituted with one or more functionalities selected from halogen, nitro, alkoxy, hydroxy, alkylthio, amino, keto, aldehyde, carboxylic acid, carboxylic ester, or carboxylic amide, and wherein two such alkyl groups on a single carbon or on adjacent carbons may together form a ring, and (iii) aryl, which may be unsubstituted or substituted with one or more functionalities selected from halogen, nitro, alkoxy, hydroxy, aryloxy, alkylthio, amino, keto, aldehyde, carboxylic acid, carboxylic ester, or carboxylic amide;

m and p are, independently, 0 or 1; and n is 0, 1 or 2.

3. The method according to claim 1 or 2 wherein said AMPA receptor potentiator is:

1-(benzofurazan-5-ylcarbonyl)piperidine;

1-(benzofurazan-5-ylcarbonyl)-4-hydroxypiperidine;

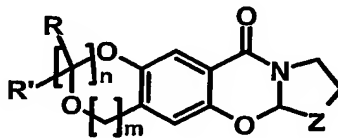
1-(benzofurazan-5-ylcarbonyl)-4-cyanopiperidine;

1-(benzofurazan-5-ylcarbonyl)morpholine (BCM); or

1-(benzofurazan-5-ylcarbonyl)-4,4-difluoropiperidine.

3. The method of claim 1 wherein the AMPA receptor potentiator is 1-(quinoxaline-6-ylcarbonyl)piperidine (CX516).

4. The method of claim 1 wherein the AMPA receptor potentiator is a compound according to the structure:



wherein

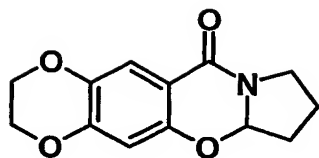
Z is  $-\text{CH}_2-$  or  $-\text{O}-$ ,

R and R' are independently hydrogen, alkyl, substituted alkyl or together form a cycloalkyl ring, or together with oxygen, sulfur or nitrogen form a heterocyclic ring.

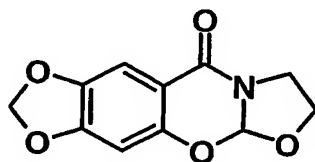
m is 0, 1 or 2, and,

n is 1 or 2.

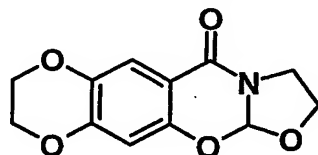
5. The method according to claim 1 or 4 wherein the AMPA receptor potentiator is a compound according to the chemical structure:



2H,3H,6aH-pyrrolidino[2'',1''-3',2']1,3-oxazaperhydroino[6',5'-2,1]benzo[4,5-e]1,4-dioxin-10-one (CX614), a compound according to the chemical structure:

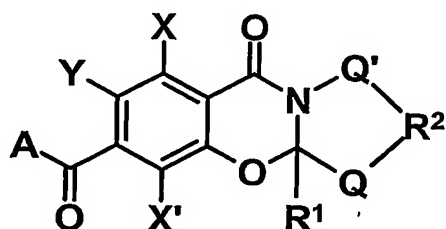


2H,7H,8H,5aH-1,3-oxazolidino[2'',3''-3',2']1,3-oxazaperhydroino[6',5'-4,5]benzo[d]1,3-dioxolen-9-one (CX554), or a compound according to the chemical structure:



2H,3H,8H,9H,6aH-1,3-oxazolidino[2'',3''-3',2']1,3-oxazaperhydroino[6',5'-4,5]benzo[e]1,4-dioxin-10-one.

6. The method of claim 1 wherein the AMPA receptor potentiator is a compound according to the structure:



wherein

Q and Q' are independently hydrogen,  $-\text{CH}_2-$ ,  $-\text{O}-$ ,  $-\text{S}-$ , alkyl, or substituted alkyl,  
 $\text{R}^1$  is hydrogen or alkyl,

$R^2$  may be absent, or if present may be  $-\text{CH}_2-$ ,  $-\text{CO}-$ ,  $-\text{CH}_2\text{CH}_2-$ ,  $-\text{CH}_2\text{CO}-$ ,  $-\text{CH}_2\text{O}-$ ,  $-\text{CRR}'-$ , or  $-\text{CONR}-$ ,

Y is hydrogen or  $-\text{OR}^3$ , or serves to link the aromatic ring to A as a single bond,  $=\text{N}-$  or  $-\text{NR}-$ ,

$R^3$  is hydrogen, alkyl, substituted alkyl, or serves to link the attached oxygen to A by being a lower alkylene such as a methylene or ethylene, or substituted lower alkylene such as  $-\text{CRR}'-$  linking the aromatic ring to A to form a substituted or unsubstituted 6, 7 or 8-membered ring, or a bond linking the oxygen to A in order to form a 5- or 6-membered ring,

A is  $-\text{NRR}'$ ,  $-\text{OR}$ , alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, cycloalkylalkyl, aryl, substituted aryl, a heterocycle or a substituted heterocycle containing one or two heteroatoms such as oxygen, nitrogen or sulfur,

R is hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, or heterocycloalkyl,

$R'$  is absent or hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl or may join together with R to form a 4- to 8-membered ring, which may be substituted by X and may be linked to Y to form a 6-membered ring and which may optionally contain one or two heteroatoms such as oxygen, nitrogen or sulfur,

X and X' are independently R, halo,  $-\text{CO}_2\text{R}$ ,  $-\text{CN}$ ,  $-\text{NRR}'$ ,  $-\text{NRCOR}'$ ,  $-\text{NO}_2$ ,  $-\text{N}_3$  or  $-\text{OR}$ .

7. The method of claim 6 wherein

Q, Q' and  $R^2$  are  $-\text{CH}_2-$ ,

X, X' and  $R^1$  are hydrogen,

Y is hydrogen or  $-\text{OR}^3$ , where  $R^3$  is hydrogen, alkyl, substituted alkyl, or serves to link the attached oxygen to A by being a lower alkylene such as a methylene or ethylene, or substituted lower alkylene such as  $-\text{CRR}'-$  linking the aromatic ring to A to form a substituted or unsubstituted 6, 7 or 8-membered ring, or a bond linking the oxygen to A in order to form a 5- or 6-membered ring,

A is  $-NRR'$ ,  $-OR$ , alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, cycloalkylalkyl, aryl, substituted aryl, a heterocycle or a substituted heterocycle containing one or two heteroatoms such as oxygen, nitrogen or sulfur,

R is hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, or heterocycloalkyl,

R' is absent or hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl or may join together with R to form a 4- to 8-membered ring, which may be substituted by X and may be linked to Y to form a 6-membered ring and which may optionally contain one or two heteroatoms such as oxygen, nitrogen or sulfur,

X and X' are independently R, halo,  $-CO_2R$ ,  $-CN$ ,  $-NRR'$ ,  $-NRCOR'$ ,  $-NO_2$ ,  $-N_3$  or  $-OR$ .

8. The method of claim 6 wherein

Q and Q' are independently hydrogen, alkyl, or substituted alkyl,

R<sup>1</sup> is hydrogen or alkyl,

R<sup>2</sup> is absent,

Y is hydrogen or  $-OR^3$ , or serves to link the aromatic ring to A as a single bond,  $=N-$  or  $-NR-$ ,

R<sup>3</sup> is hydrogen, alkyl, substituted alkyl, or serves to link the attached oxygen to A by being a lower alkylene such as a methylene or ethylene, or substituted lower alkylene such as  $-CRR'-$  linking the aromatic ring to A to form a substituted or unsubstituted 6, 7 or 8-membered ring, or a bond linking the oxygen to A in order to form a 5- or 6-membered ring,

A is  $-NRR'$ ,  $-OR$ , alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, cycloalkylalkyl, aryl, substituted aryl, a heterocycle or a substituted heterocycle containing one or two heteroatoms such as oxygen, nitrogen or sulfur,

R is hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, or heterocycloalkyl,

R' is absent or hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl,

substituted alkyl, cycloalkyl, substituted cycloalkyl or may join together with R to form a 4- to 8-membered ring, which may be substituted by X and may be linked to Y to form a 6-membered ring and which may optionally contain one or two heteroatoms such as oxygen, nitrogen or sulfur,

X and X' are independently R, halo,  $-\text{CO}_2\text{R}$ ,  $-\text{CN}$ ,  $-\text{NRR}'$ ,  $-\text{NRCOR}'$ ,  $-\text{NO}_2$ ,  $-\text{N}_3$  or  $-\text{OR}$ .

9. The method of claim 6 wherein

Q and Q' are independently hydrogen, alkyl, or substituted alkyl,

R<sup>1</sup> is hydrogen or alkyl,

R<sup>2</sup> is absent,

Y is  $-\text{OR}^3$ ,

R<sup>3</sup> is a lower alkylene such as a methylene or ethylene, or substituted lower alkylene such as  $-\text{CRR}'$ — linking the aromatic ring to A to form a substituted or unsubstituted 6, 7 or 8-membered ring, or a bond linking the oxygen to A in order to form a 5- or 6-membered ring,

A is  $-\text{NRR}'$ ,  $-\text{OR}$ , alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, cycloalkylalkyl, aryl, substituted aryl, a heterocycle or a substituted heterocycle containing one or two heteroatoms such as oxygen, nitrogen or sulfur,

R is hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, or heterocycloalkyl,

R' is absent or hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl or may join together with R to form a 4- to 8-membered ring, which may be substituted by X and may be linked to Y to form a 6-membered ring and which may optionally contain one or two heteroatoms such as oxygen, nitrogen or sulfur,

X and X' are independently R, halo,  $-\text{CO}_2\text{R}$ ,  $-\text{CN}$ ,  $-\text{NRR}'$ ,  $-\text{NRCOR}'$ ,  $-\text{NO}_2$ ,  $-\text{N}_3$  or  $-\text{OR}$ .

10. The method of claim 6 wherein

Q and Q' are independently hydrogen, alkyl, or substituted alkyl,

$R^1$  is hydrogen or alkyl,

$R^2$  is absent,

Y is  $-OR^3$ ,

$R^3$  is a lower alkylene such as a methylene or ethylene, or substituted lower alkylene such as  $-CRR'$  linking the aromatic ring to A to form a substituted or unsubstituted 6, 7 or 8-membered ring,

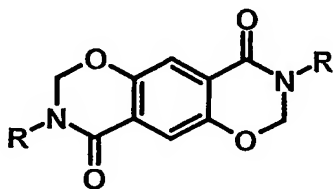
A is  $-NRR'$ , alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, cycloalkylalkyl, aryl, substituted aryl, a heterocycle or a substituted heterocycle containing one or two heteroatoms such as oxygen, nitrogen or sulfur,

R is hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, or heterocycloalkyl,

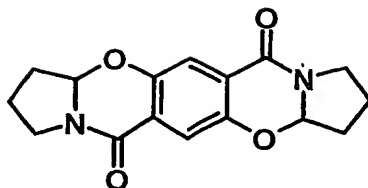
$R'$  is absent or hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl or may join together with R to form a 4- to 8-membered ring, which may be substituted by X and may be linked to Y to form a 6-membered ring and which may optionally contain one or two heteroatoms such as oxygen, nitrogen or sulfur, and

X and X' are independently R, halo,  $-CO_2R$ ,  $-CN$ ,  $-NRR'$ ,  $-NRCOR'$ ,  $-NO_2$ ,  $-N_3$  or  $-OR$ .

11. The method according to claim 10 wherein said compound is:



12. The method according to claim 10 wherein said compound is



3aH,9aH-pyrrolidino[2,1-b]pyrrolidino[2'',1''-2',3'](1,3-oxazino)[5',6'-2,1]benzo[4,5-e]1,3-oxazaperhydroine-6,12-dione.

13. The method according to claim 1 wherein said AMPA receptor potentiator is

1-(Benzofurazan-5-ylcarbonyl)morpholine (BCM);

1-(Quinoxaline-6-ylcarbonyl)piperidine (CX516);

2H,3H,6aH-Pyrrolidino[2'',1''-3',2']1,3-oxazino[6',5'-5,4]benzo[e]1,4-dioxan-10-one (CX614);

3aH,9aH-pyrrolidino[2,1-b]pyrrolidino[2'',1''-2',3'](1,3-oxazino)[5',6'-2,1]benzo[4,5-e]1,3-oxazaperhydroine-6,12-dione;

Aniracetam;

IDRA-21;

S18986;

PEPA;

[2-Fluoro-2-(4-{3-[(methylsulfonyl)amino]phenyl}propyl)  
[(methylethyl)sulfonyl]amine;

N-2-(4-(3-thienyl)phenyl)propyl methanesulfonamide;

LY392098;

LY404187;

LY450108; or

LY451398.



14. A method according to any of claims 1-13 wherein cognitive impairment is a result of acute sleep deprivation.

15. A method according to any of claims 1-13 wherein cognitive impairment is a result of chronic sleep deprivation.

16. A method according to any of claims 1-15 wherein the subject is a worker whose duties cause an interruption in normal sequence or duration of sleep cycles.

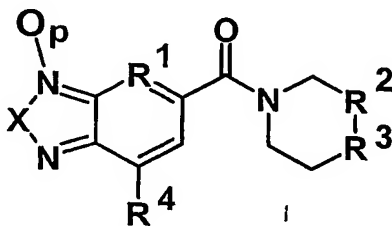
17. A method according to any of claims 1-13 wherein the subject is a person suffering from circadian rhythm disruption.

18. The method according to any of claims 1-15 wherein the subject is a patient suffering from sleep disruption as a result of disease symptomatology.

19. The method according to any of claims 1-15 wherein the subject is a service animal whose performance is impaired by sleep deprivation.

20. A pharmaceutical composition for use in the treatment or prevention of cognitive impairment as a result of acute or chronic sleep deprivation in a patient or subject, comprising an effective amount of an AMPA receptor potentiator in combination with a pharmaceutically acceptable, carrier, additive or excipient.

21. The composition of claim 20 wherein the AMPA receptor potentiator is a compound according to the structure:



wherein X = oxygen or sulfur; R<sup>1</sup> is selected from the group consisting of -N=, -CR=, or -CX=; R<sup>2</sup> is selected from the group consisting of -(CRR')<sub>n</sub>-, -C(O)-, -CR=CR'-, -CR=CX-, -CRX-,

-CXX'-, -S-, and -O-, and  $\dot{R}^3$  is selected from the group consisting of  $-(CRR')_m-$ ,  $-C(O)-$ ,  $-CR=CR'-$ ,  $-CRX-$ ,  $-CXX'-$ , -S-, and -O-;  $R^4$  is R or X; X and X' are independently selected from -Br, -Cl, -F, -CN, -NO<sub>2</sub>, -OR, -SR, -NRR',  $-C(O)R$ ,  $-CO_2R$ , or  $-CONRR'$ , wherein two groups R or R' on an individual group X, or on two adjacent groups X, may together form a ring; and

R and R' are independently selected from (i) hydrogen, (ii) C<sub>1</sub>-C<sub>6</sub> branched or unbranched alkyl, which may be unsubstituted or substituted with one or more functionalities selected from halogen, nitro, alkoxy, hydroxy, alkylthio, amino, keto, aldehyde, carboxylic acid, carboxylic ester, or carboxylic amide, and wherein two such alkyl groups on a single carbon or on adjacent carbons may together form a ring, and (iii) aryl, which may be unsubstituted or substituted with one or more functionalities selected from halogen, nitro, alkoxy, hydroxy, aryloxy, alkylthio, amino, keto, aldehyde, carboxylic acid, carboxylic ester, or carboxylic amide;

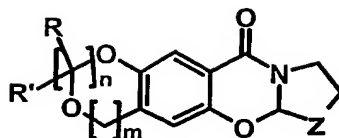
m and p are, independently, 0 or 1; and n is 0, 1 or 2.

22. The composition according to claim 20 or 21 wherein said AMPA receptor potentiator is:

- 1-(benzofurazan-5-ylcarbonyl)piperidine;
- 1-(benzofurazan-5-ylcarbonyl)-4-hydroxypiperidine;
- 1-(benzofurazan-5-ylcarbonyl)-4-cyanopiperidine;
- 1-(benzofurazan-5-ylcarbonyl)morpholine (BCM); or
- 1-(benzofurazan-5-ylcarbonyl)-4,4-difluoropiperidine.

23. The composition of claim 20 wherein the AMPA receptor potentiator is 1-(quinoxaline-6-ylcarbonyl)piperidine (CX516).

24. The composition of claim 20 wherein the AMPA receptor potentiator is a compound according to the structure:



wherein

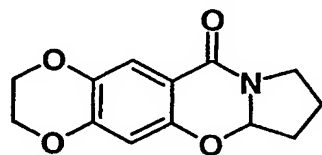
Z is  $-\text{CH}_2-$  or  $-\text{O}-$ ,

R and R' are independently hydrogen, alkyl, substituted alkyl or together form a cycloalkyl ring, or together with oxygen, sulfur or nitrogen form a heterocyclic ring.

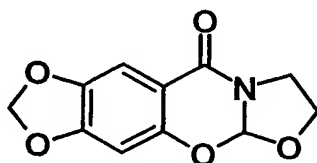
m is 0, 1 or 2, and,

n is 1 or 2.

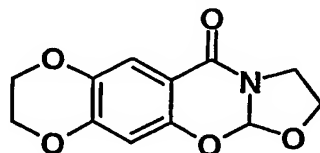
25. The composition according to claim 1 or 24 wherein the AMPA receptor potentiator is a compound according to the chemical structure:



2H,3H,6aH-pyrrolidino[2'',1''-3',2']1,3-oxazaperhydroino[6',5'-2,1]benzo[4,5-e]1,4-dioxin-10-one (CX614), a compound according to the chemical structure:

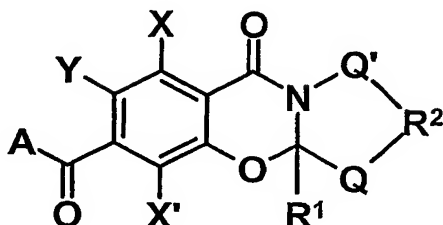


2H,7H,8H,5aH-1,3-oxazolidino[2'',3''-3',2']1,3-oxazaperhydroino[6',5'-4,5]benzo[d]1,3-dioxolen-9-one (CX554), or a compound according to the chemical structure:



2H,3H,8H,9H,6aH-1,3-oxazolidino[2'',3''-3',2']1,3-oxazaperhydroino[6',5'-4,5]benzo[e]1,4-dioxin-10-one.

26. The composition of claim 20 wherein the AMPA receptor potentiator is a compound according to the structure:



wherein

Q and Q' are independently hydrogen,  $-\text{CH}_2-$ ,  $-\text{O}-$ ,  $-\text{S}-$ , alkyl, or substituted alkyl,

$\text{R}^1$  is hydrogen or alkyl,

$\text{R}^2$  may be absent, or if present may be  $-\text{CH}_2-$ ,  $-\text{CO}-$ ,  $-\text{CH}_2\text{CH}_2-$ ,  $-\text{CH}_2\text{CO}-$ ,  $-\text{CH}_2\text{O}-$ ,  $-\text{CRR}'-$ , or  $-\text{CONR}-$ ,

Y is hydrogen or  $-\text{OR}^3$ , or serves to link the aromatic ring to A as a single bond,  $=\text{N}-$  or  $-\text{NR}-$ ,

$\text{R}^3$  is hydrogen, alkyl, substituted alkyl, or serves to link the attached oxygen to A by being a lower alkylene such as a methylene or ethylene, or substituted lower alkylene such as  $-\text{CRR}'-$  linking the aromatic ring to A to form a substituted or unsubstituted 6, 7 or 8-membered ring, or a bond linking the oxygen to A in order to form a 5- or 6-membered ring,

A is  $-\text{NRR}'$ ,  $-\text{OR}$ , alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, cycloalkylalkyl, aryl, substituted aryl, a heterocycle or a substituted heterocycle containing one or two heteroatoms such as oxygen, nitrogen or sulfur,

R is hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, or heterocycloalkyl,

$\text{R}'$  is absent or hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl or may join together with R to form a 4- to 8-membered ring, which may be substituted by X and may be linked to Y to form a 6-membered ring and which may optionally contain one or two heteroatoms such as oxygen, nitrogen or

sulfur,

X and X' are independently R, halo,  $-\text{CO}_2\text{R}$ ,  $-\text{CN}$ ,  $-\text{NRR}'$ ,  $-\text{NRCOR}'$ ,  $-\text{NO}_2$ ,  $-\text{N}_3$  or  $-\text{OR}$ .

27. The composition of claim 26 wherein

Q, Q' and  $\text{R}^2$  are  $-\text{CH}_2-$ ,

X, X' and  $\text{R}^1$  are hydrogen,

Y is hydrogen or  $-\text{OR}^3$ , where  $\text{R}^3$  is hydrogen, alkyl, substituted alkyl, or serves to link the attached oxygen to A by being a lower alkylene such as a methylene or ethylene, or substituted lower alkylene such as  $-\text{CRR}'-$  linking the aromatic ring to A to form a substituted or unsubstituted 6, 7 or 8-membered ring, or a bond linking the oxygen to A in order to form a 5- or 6-membered ring,

A is  $-\text{NRR}'$ ,  $-\text{OR}$ , alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, cycloalkylalkyl, aryl, substituted aryl, a heterocycle or a substituted heterocycle containing one or two heteroatoms such as oxygen, nitrogen or sulfur,

R is hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, or heterocycloalkyl,

R' is absent or hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl or may join together with R to form a 4- to 8-membered ring, which may be substituted by X and may be linked to Y to form a 6-membered ring and which may optionally contain one or two heteroatoms such as oxygen, nitrogen or sulfur,

X and X' are independently R, halo,  $-\text{CO}_2\text{R}$ ,  $-\text{CN}$ ,  $-\text{NRR}'$ ,  $-\text{NRCOR}'$ ,  $-\text{NO}_2$ ,  $-\text{N}_3$  or  $-\text{OR}$ .

28. The composition of claim 26 wherein

Q and Q' are independently hydrogen, alkyl, or substituted alkyl,

$\text{R}^1$  is hydrogen or alkyl,

$\text{R}^2$  is absent,

Y is hydrogen or  $-\text{OR}^3$ , or serves to link the aromatic ring to A as a single bond,  $=\text{N}-$  or  $-\text{N}=\text{N}-$

NR—,

R<sup>3</sup> is hydrogen, alkyl, substituted alkyl, or serves to link the attached oxygen to A by being a lower alkylene such as a methylene or ethylene, or substituted lower alkylene such as —CRR'— linking the aromatic ring to A to form a substituted or unsubstituted 6, 7 or 8-membered ring, or a bond linking the oxygen to A in order to form a 5- or 6-membered ring,

A is —NRR', —OR, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, cycloalkylalkyl, aryl, substituted aryl, a heterocycle or a substituted heterocycle containing one or two heteroatoms such as oxygen, nitrogen or sulfur,

R is hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, or heterocycloalkyl,

R' is absent or hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl or may join together with R to form a 4- to 8-membered ring, which may be substituted by X and may be linked to Y to form a 6-membered ring and which may optionally contain one or two heteroatoms such as oxygen, nitrogen or sulfur,

X and X' are independently R, halo, —CO<sub>2</sub>R, —CN, —NRR', —NRCOR', —NO<sub>2</sub>, —N<sub>3</sub> or —OR.

29. The composition of claim 26 wherein

Q and Q' are independently hydrogen, alkyl, or substituted alkyl,

R<sup>1</sup> is hydrogen or alkyl,

R<sup>2</sup> is absent,

Y is —OR<sup>3</sup>,

R<sup>3</sup> is a lower alkylene such as a methylene or ethylene, or substituted lower alkylene such as —CRR'— linking the aromatic ring to A to form a substituted or unsubstituted 6, 7 or 8-membered ring, or a bond linking the oxygen to A in order to form a 5- or 6-membered ring,

A is —NRR', —OR, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, cycloalkylalkyl, aryl, substituted aryl, a heterocycle or a substituted heterocycle containing one or two heteroatoms such as oxygen, nitrogen or sulfur,

R is hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, or heterocycloalkyl,

R' is absent or hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl or may join together with R to form a 4- to 8-membered ring, which may be substituted by X and may be linked to Y to form a 6-membered ring and which may optionally contain one or two heteroatoms such as oxygen, nitrogen or sulfur,

X and X' are independently R, halo,  $-\text{CO}_2\text{R}$ ,  $-\text{CN}$ ,  $-\text{NRR}'$ ,  $-\text{NRCOR}'$ ,  $-\text{NO}_2$ ,  $-\text{N}_3$  or  $-\text{OR}$ .

30. The composition of claim 26 wherein

Q and Q' are independently hydrogen, alkyl, or substituted alkyl,

R<sup>1</sup> is hydrogen or alkyl,

R<sup>2</sup> is absent,

Y is  $-\text{OR}^3$ ,

R<sup>3</sup> is a lower alkylene such as a methylene or ethylene, or substituted lower alkylene such as  $-\text{CRR}'$  linking the aromatic ring to A to form a substituted or unsubstituted 6, 7 or 8-membered ring,

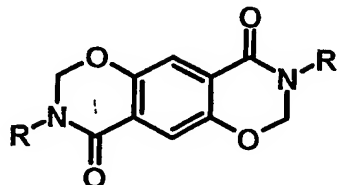
A is  $-\text{NRR}'$ , alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, cycloalkylalkyl, aryl, substituted aryl, a heterocycle or a substituted heterocycle containing one or two heteroatoms such as oxygen, nitrogen or sulfur,

R is hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, or heterocycloalkyl,

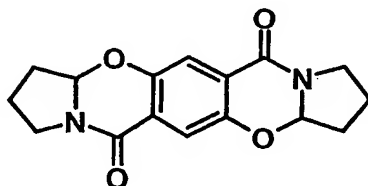
R' is absent or hydrogen, aryl, arylalkyl, substituted aryl, substituted arylalkyl, alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl or may join together with R to form a 4- to 8-membered ring, which may be substituted by X and may be linked to Y to form a 6-membered ring and which may optionally contain one or two heteroatoms such as oxygen, nitrogen or sulfur, and

X and X' are independently R, halo,  $-\text{CO}_2\text{R}$ ,  $-\text{CN}$ ,  $-\text{NRR}'$ ,  $-\text{NRCOR}'$ ,  $-\text{NO}_2$ ,  $-\text{N}_3$  or  $-\text{OR}$ .

31. The composition according to claim 30 wherein said compound is:



32. The composition according to claim 30 wherein said compound is



3a*H*,9a*H*-pyrrolidino[2,1-*b*]pyrrolidino[2'',1''-2',3'](1,3-oxazino)[5',6'-2,1]benzo[4,5-*e*]1,3-oxazaperhydroine-6,12-dione.

33. The composition according to claim 20 wherein said AMPA receptor potentiator is:

1-(Benzofurazan-5-ylcarbonyl)morpholine (BCM);

1-(Quinoxaline-6-ylcarbonyl)piperidine (CX516);

2*H*,3*H*,6a*H*-Pyrrolidino[2'',1''-3',2'']1,3-oxazino[6',5'-5,4]benzo[*e*]1,4-dioxan-10-one (CX614);

3a*H*,9a*H*-pyrrolidino[2,1-*b*]pyrrolidino[2'',1''-2',3'](1,3-oxazino)[5',6'-2,1]benzo[4,5-*e*]1,3-oxazaperhydroine-6,12-dione;

Aniracetam;

IDRA-21;

S18986;

PEPA;

[2-Fluoro-2-(4-{3-[(methylsulfonyl)amino]phenyl}propyl)  
[(methylethyl)sulfonyl]amine;



N-2-(4-(3-thienyl)phenyl)propyl methanesulfonamide;

LY392098;

LY404187;

LY450108; or

LY451398.

34. Use of a composition in the manufacture of a medicament for treating or preventing cognitive impairment as a result of acute or chronic sleep deprivation in a patient or subject, said composition comprising an effective amount of a pharmaceutical composition according to any of claims 20-33.